

Claims

- [c1] What is claimed is:
1. A control system for in-situ feeding back a polish profile of a chemical mechanical polishing (CMP) machine, the CMP machine comprising a polish platen, the polish platen comprising at least a first ring-shaped region and a second ring-shaped region, a polish pad installed on the polish platen, a carrier head for holding a wafer positioned over the polish pad, the carrier head at least comprising an inner portion and an outer portion corresponding to the first ring-shaped region and the second ring-shaped region, respectively, and a slurry supply device, the slurry supply device comprising a first slurry pump valve positioned corresponding to the first ring-shaped region, and a second slurry pump valve positioned corresponding to the second ring-shaped region, the control system comprising:
at least a first sensor and a second sensor, installed in the first ring-shaped region and the second ring-shaped region, respectively; and
a control unit electrically connected to the first sensor and the second sensor for comparing the polish rate of the wafer over the first ring-shaped region and the polish rate of the wafer over the second ring-shaped region according to signals of the first sensor and the second sensor, and adjusting the amounts of the slurry supplied by the first slurry pump valve and supplied by the second slurry pump valve according to a predetermined process, or adjusting the force loaded by the inner portion of the carrier head and loaded by the outer portion of the carrier head according to the predetermined process.
 2. The control system of claim 1 wherein the control system is used in a single wafer CMP machine, or used in a multi-wafer CMP machine.
 3. The control system of claim 1 wherein the first sensor and the second sensor are both thermal couples, or are both infrared (IR) sensors.
 4. The control system of claim 3 wherein the signals transferred by the first sensor and the second sensor are surface temperatures of the wafer, and the predetermined process adjusts the amounts of the slurry supplied by the first slurry pump valve and supplied by the second slurry pump valve, or adjusts the force loaded by the inner portion of the carrier head and loaded by the outer portion of the carrier head according to a difference of the surface temperatures of the wafer.

- [c5] 5. The control system of claim 1 wherein the first sensor and the second sensor are both optical sensors.
- [c6] 6. The control system of claim 5 wherein the signals transferred by the first sensor and the second sensor are thicknesses of a thin film on the wafer, and the predetermined process adjusts the amounts of the slurry supplied by the first slurry pump valve and supplied by the second slurry pump valve, or adjusts the force loaded by the inner portion of the carrier head and loaded by the outer portion of the carrier head according to a difference of the thicknesses of the thin film.
- [c7] 7. A control system for in-situ feeding back a polish profile of a chemical mechanical polishing (CMP) machine, the CMP machine comprising a polish platen, the polish platen comprising at least a first ring-shaped region and a second ring-shaped region, a polish pad installed on the polish platen, a carrier head for holding a wafer positioned over the polish pad, and a slurry supply device, the slurry supply device comprising a first slurry pump valve positioned corresponding to the first ring-shaped region, and a second slurry pump valve positioned corresponding to the second ring-shaped region, the control system comprising:
at least a first sensor and a second sensor, installed in the first ring-shaped region and the second ring-shaped region, respectively; and
a control unit electrically connected to the first sensor and the second sensor for comparing the polish rate of the wafer over the first ring-shaped region and the polish rate of the wafer over the second ring-shaped region according to signals of the first sensor and the second sensor, respectively, and adjusting amounts of the slurry supplied by the first slurry pump valve and supplied by the second slurry pump valve according to a predetermined process.
- [c8] 8. The control system of claim 7 wherein the control system is used in a single wafer CMP machine, or used in a multi-wafer CMP machine.
- [c9] 9. The control system of claim 7 wherein the first sensor and the second sensor are both thermal couples, or are both infrared (IR) sensors.
- [c10] 10. The control system of claim 9 wherein the signals transferred by the first sensor and the second sensor are surface temperatures of the wafer, and the predetermined process adjusts the amounts of the slurry supplied by the first slurry pump valve and supplied by

the second slurry pump valve according to a difference of the surface temperatures of the wafer.

[c11] 11. The control system of claim 7 wherein the first sensor and the second sensor are both optical sensors.

[c12] 12. The control system of claim 11 wherein the signals transferred by the first sensor and the second sensor are thicknesses of a thin film on the wafer, and the predetermined process adjusts the amounts of the slurry supplied by the first slurry pump valve and supplied by the second slurry pump valve according to a difference of the thicknesses of the thin film.

[c13] 13. A control system for in-situ feeding back a polish profile of a chemical mechanical polishing (CMP) machine, the CMP machine comprising a polish platen, the polish platen comprising at least a first ring-shaped region and a second ring-shaped region, a polish pad installed on the polish platen, a carrier head for holding a wafer positioned over the polish pad, and a slurry supply device, the control system comprising:
at least a first sensor and a second sensor, installed in the first ring-shaped region and the second ring-shaped region, respectively; and
a control unit electrically connected to the first sensor and the second sensor for comparing the polish rate of the wafer over the first ring-shaped region and the polish rate of the wafer over the second ring-shaped region according to signals of the first sensor and the second sensor, and adjusting the heights of the inner portion of the polish platen and the outer portion of the polish platen according to a predetermined process.

[c14] 14. The control system of claim 13 wherein the control system is used in a single wafer CMP machine, or used in a multi-wafer CMP machine.

[c15] 15. The control system of claim 13 wherein the first sensor and the second sensor are both thermal couples, or are both infrared (IR) sensors.

[c16] 16. The control system of claim 15 wherein the signals transferred by the first sensor and the second sensor are surface temperatures of the wafer, and the predetermined process adjusts the heights of the inner portion of the polish platen and the outer portion of the polish platen according to a difference of the surface temperatures of the wafer.

[c17] 17. The control system of claim 13 wherein the first sensor and the second sensor are both optical sensors.

[c18] 18. The control system of claim 17 wherein the signals transferred by the first sensor and the second sensor are thicknesses of a thin film on the wafer, and the predetermined process adjusts the heights of the inner portion of the polish platen and the outer portion of the polish platen according to a difference of the thicknesses of the thin film.

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